

[0027] FIG. 17 is a flow chart illustrating the method of adaptation of the display screen.

DETAILED DESCRIPTION

[0028] As intimated hereinabove, one of the more important aspects of the handheld electronic device to which this disclosure is directed is its size. While some users will grasp the handheld device in both hands, it is intended that a predominance of users will cradle the handheld device in one hand in such a manner that input and control over the handheld device can be affected using the thumb of the same hand in which the handheld device is held. However, it is appreciated that additional control can be effected by using both hands. As a handheld device that is desirably pocketable, the size of the handheld device must be kept relatively small. Of the handheld device's dimensions, limiting its width is important for the purpose of assuring cradleability in a user's hand. Moreover, it is preferred that the width of the handheld device be maintained at less than eight centimeters (approximately three inches). Keeping the handheld device within these dimensional limits provides a hand cradleable unit that users prefer for its useability and portability. Limitations with respect to the height (length) of the handheld device are less stringent when considering hand-cradleability. Therefore, in order to gain greater size, the handheld device can be advantageously configured so that its height is greater than its width, but still remains easily supported and operated in one hand.

[0029] A potential drawback is presented by the small size of the handheld device in that there is limited exterior surface area for the inclusion of user input and handheld device output features. This is especially true for the "prime real estate" on the front face of the device, where it is most advantageous to include a display screen that outputs information to the user.

[0030] This disclosure presents a variety of different handheld devices 300 that are capable of presenting a shape adaptive display to the user. In one example, the handheld device 300a, as shown in FIG. 1, is provided with navigation keys and a trackball navigation tool 325 which provides for on screen cursor navigation. In another example, only an adaptive display screen 322 is provided on the front face 370 of the handheld device 300b, as shown in FIGS. 2A, 2B, 11-14. In yet another example as shown in FIG. 15, the handheld device 300c is equipped with an adaptive display screen 322, a physical keyboard arrangement 332, and a trackball navigational tool 325 on the front face 370 of the handheld device 300c.

[0031] In one of the presently described embodiments as shown in FIG. 1, a key arrangement 280 is presented on the adaptive display screen 322 of the handheld communication device 300a. While in other embodiments, such as FIG. 15, both a physical keyboard 332 and a key arrangement 282 on the display screen 322 are presented to the user on the front face 370 of the handheld device 300c. In this presentation, the key arrangement 282 shown on the display screen 322 is different from the arrangement of the physical keyboard 332, but in other embodiments the key arrangement can be the same as the physical keyboard 332. The key arrangements are presented below other data on the display screen 322, thereby assuring that the user's hands and fingers do not block viewing of the other data during entry.

[0032] To facilitate textual data entry, an alphabetic key arrangement can be displayed on the display screen 322 for

inputting textual characters. In one version, a full alphabetic key arrangement 280 is utilized in which there is one key per letter (see FIG. 1 for an example). This is preferred by some users because it can be arranged to resemble a standard keyboard with which they are most familiar. In this regard, the associated letters can be advantageously organized in QWERTY, QWLRZT, AZERTY or Dvorak layouts, among others, thereby capitalizing on certain users' familiarity with these special letter orders. In order to stay within the bounds of a limited display surface area, however, each of the keys must be commensurately small when, for example, twenty-six keys must be provided in the instance of the English language. An alternative configuration is to provide a reduced alphabetic key arrangement 281 in which at least some of the keys have more than one letter associated therewith (see FIGS. 12 and 14 for examples). This means that fewer keys are required which makes it possible for those fewer keys to each be larger than in the instance when a full key arrangement is provided on a similarly dimensioned handheld device 300. Some users will prefer the solution of the larger keys over the smaller ones, but it is necessary that software or hardware solutions be provided in order to discriminate which of the several associated letters the user intends based on a particular key actuation, a problem the full alphabetic key arrangement avoids. Preferably, this character discrimination is accomplished utilizing disambiguation software included on the handheld device 300b. To accommodate software use on the handheld device 300b, a memory and microprocessor 338 are provided within the body of the handheld device 300b for receiving, storing, processing, and outputting data during use. Therefore, the problem of needing a textual data input means is solved by the provision of either a full or reduced alphabetic key arrangement on the presently disclosed handheld device.

[0033] Keys perform well as data entry devices but present problems to the user when they must also be used to affect navigational control over a screen-cursor. In order to solve this problem, the handheld device 300a can include an auxiliary input that acts as a cursor navigation tool and which is also exteriorly located upon the front face 370 of the handheld device 300a, as shown in FIG. 1. Its front face location is particularly advantageous because it makes the tool easily thumb-actuable. In a particularly useful embodiment, the navigational tool is a trackball navigational tool 325 which is easily utilized to instruct two-dimensional screen cursor movement in substantially any direction, as well as act as an actuator when the ball 321 of the trackball navigational tool 325 is depressed like a button (see FIG. 1 for an example). The placement of the trackball navigational tool 325 is preferably below the display screen 322 and above any additional input buttons on the front face 370 of the handheld device; here, it does not block the user's view of the display screen 322 during use. In other embodiments as described below, the navigational tool may be provided as part of the adaptive display screen 322.

[0034] In some configurations, the handheld device 300 may be standalone in that it does not connect to the "outside world." One example would be a PDA that stores such things as calendars and contact information but is not capable of synchronizing or communicating with other devices. In most situations such isolation will be viewed detrimentally in that synchronization is a highly desired characteristic of handheld devices 300 today. Moreover, the utility of the handheld device 300 is significantly enhanced when connectable